

Validation of a Foldable and Photovoltaic Wide-Field Epiretinal Prosthesis

Diego Ghezzi, *Member, IEEE*

Medtronic Chair in Neuroengineering, Center for Neuroprosthetics, Institute of Bioengineering, School of Engineering, École Polytechnique Fédérale de Lausanne, Switzerland

diego.ghezzi@epfl.ch

Abstract

Inspired by intra ocular lenses, we designed a foldable and wide-field epiretinal prosthesis capable of achieving a wireless photovoltaic stimulation of retinal ganglion cells with a remarkable increase in its retinal coverage and in the number of stimulating pixels. Within a visual angle of 46.9 degrees, it embeds 2215 stimulating pixels, of which 967 are in the central area of 5 mm. It is foldable to limit the scleral incision during implantation and it has a hemispherical shape to remain in tight contact with the retina. We also demonstrate that the prosthesis is not cytotoxic, while accelerated ageing shows a lifetime of at least 2 years. Moreover, it fulfills optical and thermal safety requirements. Last, the flexibility of the fabrication process may allow the production of a hemispherical prosthesis adjusted to the real eye curvature of the patient. These advances provide a solution towards the improvement of both visual acuity and visual field in blind patients.

Short Bio

Prof. Diego Ghezzi holds the Medtronic Chair in Neuroengineering at the Interfaculty Institute of Bioengineering, School of Engineering, of the Ecole Polytechnique Fédérale de Lausanne. He received his M.Sc. in Biomedical Engineering (2004) and Ph.D. in Bioengineering (2008) from Politecnico di Milano. From 2008 to 2013, he completed his postdoctoral training at Istituto Italiano di Tecnologia in Genova at the department of Neuroscience and Brain Technologies; where he was promoted Researcher in 2013. In 2015, he was appointed as Tenure Track Assistant Professor of Bioengineering at EPFL. He is currently affiliated to the EPFL Center for Neuroprosthetics. His research activities are primarily focused on the implementation of novel technological approaches for sight restoration, and in general on the development of technologies to talk with the nervous systems.